Science Update

INSIDE

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Landscape Models: Helping Land Managers Think Big

In a sun-baked, grassy clearing on the east side of the Cascade Range in central Washington, Pacific Northwest (PNW) Research Station landscape ecologist Miles Hemstrom and a group of ecologists and land managers from the Washington Department of Natural Resources (DNR) gather in the shade of a ponderosa pine. Hundreds of years old, this ancient pine has withstood temperature extremes and droughts. It's now the lone tree in the clearing.

In general, the forests in eastern Washington look very different than the lush Douglas-fir forests growing in the milder climate just over the crest of the Cascades. Dominated by ponderosa and lodgepole pines, the east-side landscape tends toward weathered shades of brown, sage, and grey.

"'Old growth' means something entirely different on the east side of the Cascades than on the west side," comments Hemstrom. "Here, it's almost down to individual trees, rather than whole stands."

The relative rarity of this old ponderosa pine is what brought the researchers here. "We are trying to find old-growth pine forest on the east side," says Hemstrom. "Washington DNR wants to know how much is out there." The moisture-stressed trees on the east side are vulnerable to half a dozen or so different insects and pathogens. In addition, fire exclusion and other management practices over the last century are contributing to larger and more severe wildfires than the norm prior to Euro-American settlement. The end result is a shifting

> "The natural world doesn't care about political boundaries. We need to think in terms of wholes, not pieces."

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Researchers gather around an old-growth ponderosa pine tree in eastern Washington. Susceptibility to uncharacteristically severe fire and epidemic levels of insects and disease have led to a sense of urgency in managing dry forests east of the Cascade Range in Oregon and Washington.

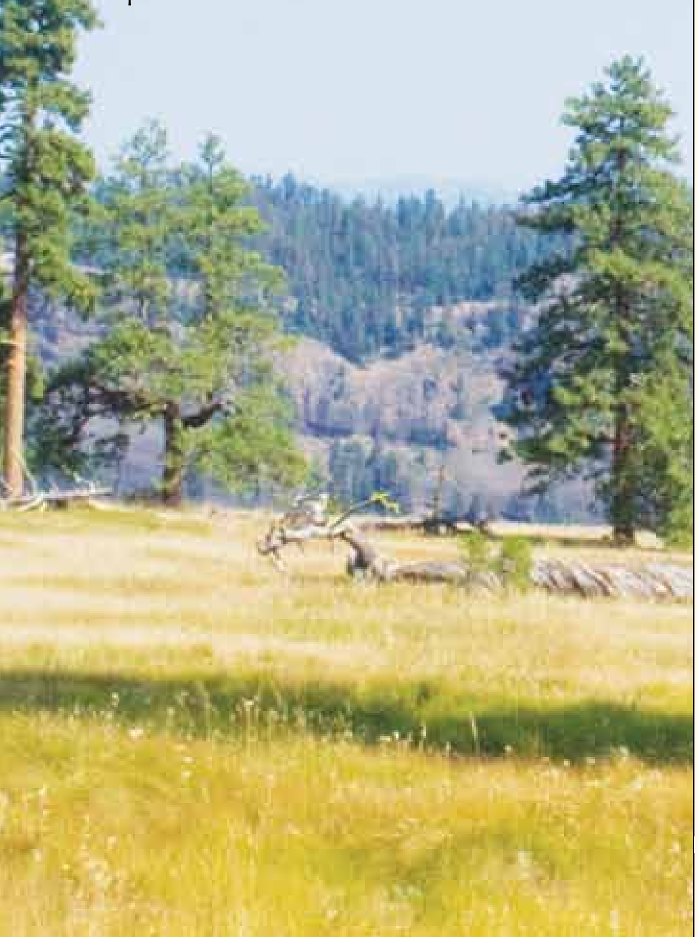
Key Points

- The Integrated Landscape Assessment Project (ILAP) applies a landscape-scale approach to planning and management across ownerships in Arizona, New Mexico, Oregon, and Washington. It can help the public, land managers, and policymakers see the different roles each landowner plays and learn how they can work together to produce outcomes on a larger landscape.

- Easily used visual information such as maps, graphs, and tables facilitate discussion and analysis of the impacts of different management scenarios or natural disturbances. This information serves as a shared reference that agencies and organizations with different missions and objectives can use to collectively look at a landscape and engage in discussion.

- ILAP's success in working with many partners rests on the principle that analyses are driven by policy problems identified by users.

- Collaborative research with managers takes time and financial investment. Projects that claim to be aimed at users, including ILAP, often don't devote enough resources to outreach. ILAP coordinators found they should have allocated at least 20 percent of their project budget toward working directly with users to make sure their questions are answered.



pattern of vitality and decay across the landscape. To address the management challenges presented by these conditions, land managers and policymakers have asked for tools that will help them evaluate strategies for reducing fire risk, improving wildlife habitat, and creating economic benefits for rural communities.

In Portland, Oregon, Gretchen Nicholas, former manager of the Land Management Division at Washington DNR, explains, "While with the DNR, I was struggling with policy issues related to the dry, disturbance-prone forests on the east side," she says. "I needed to know what policies could be implemented to conserve old trees and northern spotted owl habitat. This required a cross-owner landscape analysis, because the practices of your neighbors have a huge impact on your own land."

Real-world experiments that examine management alternatives across thousands of acres are difficult and expensive. Landscape models that simulate experiments let users evaluate potential scenarios and forge a path through complex problems toward a decision. They can be used to assess the incremental and cumulative effects of natural disturbances as well as activities such as timber harvests, thinning treatments, or environmental restoration over large landscapes. Different management scenarios can be compared with the help of visual data such as maps, graphs, and tables. This kind of "what if" exercise can provide a unique opportunity to understand interactions among biophysical, social, and economic factors that shape a landscape.

Hemstrom has worked on landscape assessments for 20 years, finding ways to piece together information and models to understand what is happening across big landscapes. "There are several approaches you can take to doing landscape science," explains Hemstrom. "One is to drill down into the minute details of chemistry, genetics, or physiology . . . the basics of vegetation development. Another way is to look at how all those finer-scale processes integrate into forests, woodlands, shrublands, and other vegetation types across larger areas. My interest is at the watershed, or mountain range, or landscape level," he says. "The natural world doesn't care about our political boundaries. We need to think in terms of 'wholes,' not in terms of pieces."

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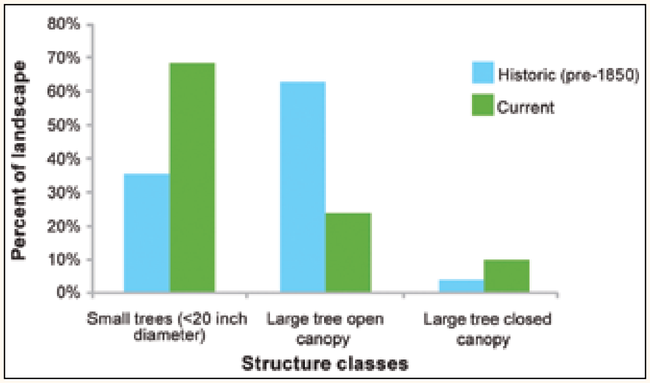
◀ *Eastern Washington Cascades. ©Miles Hemstrom*

The Tapash Collaborative: using landscape models to build restoration strategies

Gretchen Nicholas was not alone in her struggle to preserve old trees and deal with the risk of fire and insect outbreaks in dry, ecologically complex forests. Washington DNR, where she worked before moving to the PNW Research Station in 2010, is part of the Tapash Collaborative, a local restoration alliance established in 2006 that also includes The Nature Conservancy, the U.S. Forest Service, the Washington Department of Fish and Wildlife, and the Yakama Nation. In the checkerboard of ownerships across central Washington, these parties sit on most of the squares. They recognized the need to work collaboratively to devise management strategies that transcend property lines.

Angus Brodie, assistant manager of the Forest Resources and Conservation Division at Washington DNR, oversees the policy and budget implementation of Washington's forest land management, which includes on-the-ground activities like silviculture and timber sales, as well as planning. Brodie describes the Tapash as a collaborative effort among a group of managers. "We want to know what the best sort of management is at this large landscape scale," he explains. "What should we be doing as multiple landowners to coordinate our efforts to restore these forests and get them back on a healthy, sustainable level so we can generate income and all the other ecosystem services we want to produce?" The Tapash group agreed to a series of shared goals for the landscape, including restoration, recovery of threatened or endangered species, and the use of science-based management tools.

One of the science-based tools they turned to was the Interagency Mapping and Assessment Project (IMAP)—the first phase of what would later become the Integrated Landscape Assessment Project. Forest Service scientists, working with partners, developed this innovative landscape modeling approach, which is built on decades of research at the PNW Research Station and collaborating universities.



Joshua Halofsky and Miles Hemstrom

This sample output from the central Washington analysis for the Tapash Collaborative shows how forest structure has changed across the landscape. Ponderosa pines larger than 20 inches in diameter in stands with less than 40 percent canopy cover (open category) are less prevalent than they were prior to 1850.

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Miles Hemstrom discusses big-picture science with the Integrated Landscape Assessment Project (ILAP) team on Mount Hood, Oregon. ILAP continues a tradition of landscape analysis in the Pacific Northwest dating back to the 1990s and the Northwest Forest Plan.

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Tools and information from the Integrated Landscape Assessment Project (ILAP) can be used in watershed restoration strategies, forest plan revisions, statewide assessments or bioregional plans. ILAP output can also inform the efforts of Collaborative Forest Landscape Restoration Groups and local conservation efforts.

The Tapash Collaborative invited the IMAP team to conduct analyses incorporating forest succession, natural disturbances (wildfire, insect outbreaks, root disease, and windthrow), and management regimes, to illustrate the likely impacts of these change agents on dry forests. Focused on a 2 million-acre landscape in east-central Washington, the resulting analysis compared two scenarios: the current management approach (which included precommercial thinning, partial harvests, prescribed wildfire, and regeneration harvest) with a no-active-management approach (other than fire suppression). Outputs were summarized to show projected future wildfire trends, wildlife habitat condition, timber volume produced, forest structure, and potential for biomass utilization under each management approach.

IMAP shows that without a change in management approach, forests will become less resilient to disturbance, large trees will decline, and future economic opportunities could be lost.

Modeling results suggested that open, large-diameter ponderosa pine forests are less prevalent today than historically, and under current management practices, it is unlikely that such forests can be sustainably maintained. Across the dry provinces of eastern Washington, eastern Oregon, and northern California, open stands of large, old ponderosa pine are being lost to stand-replacing fire and subsequent fill-in of undergrowth and small trees. If this rate of loss continues, these landscapes will lose much of their existing open forests of large, old ponderosa pine in the next 50 years.

The analysis also showed that closed-canopy forests are more common now after a century of fire suppression. As it turns out, northern spotted owls prefer these denser forests. They do not use the open ponderosa pine or mixed-conifer types that were historically widespread in much of the dry provinces. Model output shows that most potential owl habitat is now found in areas that historically had little or none. “There didn’t use to be a lot of owl habitat on the east side, but now there is,” says Hemstrom. “The problem is, what do you do with it? How do you protect it, and what are the trade-offs with other things that you value from the same landscape?”

The questions Hemstrom raises point to a dilemma: the Northwest Forest Plan mandates the protection of owl habitat, but these dense, closed canopy forests on the east side are in a crowded and precarious state, prone to fire and insect attacks from which they can't always recover. As a case in point, forests on the Yakama Indian Reservation in central Washington have seen substantial losses of northern spotted owl habitat due to spruce budworm epidemics. The Northwest Forest Plan addressed the risk of high-severity fire in dry east-side forests by calling for fire hazard reduction treatments in reserves designated to protect current and potential spotted owl habitat. But budget constraints have hampered the implementation of this mandate, and treatments have not always happened at the scale necessary to reduce fire and insect risks across the landscape. Given the circumstances, managers need to know if current management is making a difference.

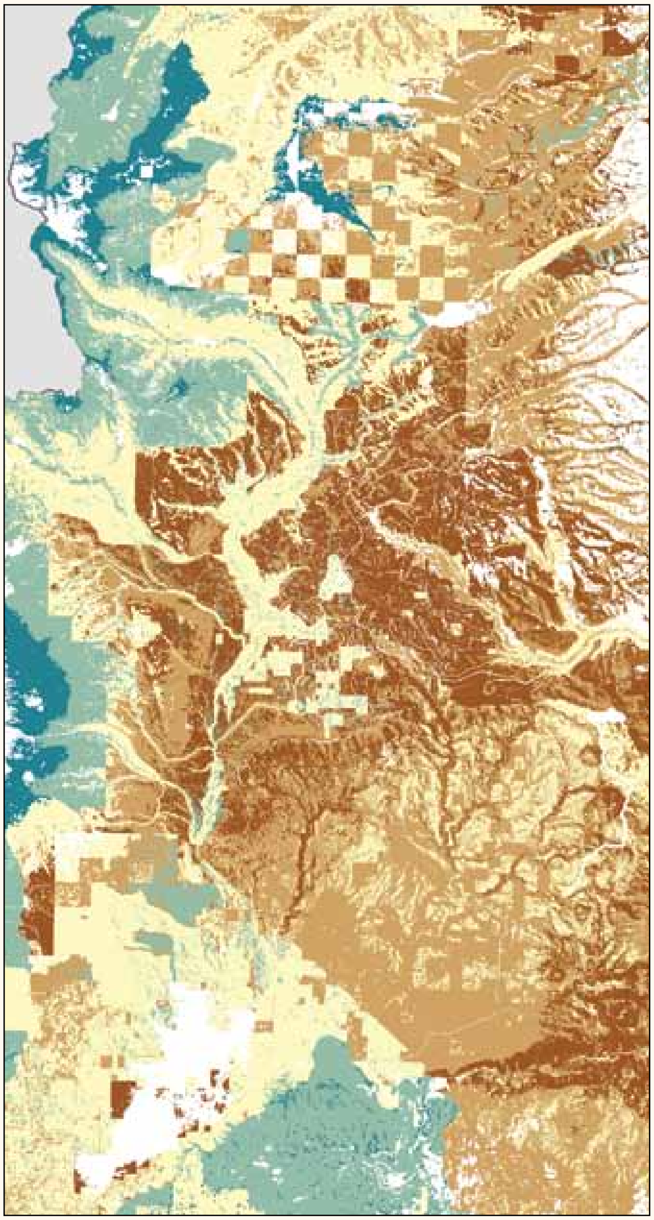
The answer? No. Current levels of precommercial thinning, partial harvests, and prescribed fire are not mitigating the influence of natural disturbances on forest structure across the landscape as a whole. "The status quo is not making a difference," admits Brodie. "It was everybody's feeling that we weren't doing enough before, but the analysis confirmed it." The implications are clear: without a change in management approach, forests will become less resilient to disturbance, large trees will decline, and there could be losses in future economic opportunities related to biomass, timber volume, and carbon markets. Retaining spotted owl habitat in these dry forests into the future likely will be very difficult.

Maps and graphs allow people who don't necessarily know all the science to view the data on a common level. This is vitally important for public debates about management choices.

Changing the current management approach is potentially controversial. "Any time you propose a change from the status quo, even if the status quo isn't ideal, you find you are treading on people's toes," Brodie says. "This is where IMAP and the spatial data it produces are very important, because it provides visual outputs showing why a new proposal is a better decision than what we're currently doing. It allows people who don't necessarily know all the science or all the interrelationships to view the data on a common level. To me, that is vitally important for public debates about management choices before we forge ahead and do what we're going to do."

In 2010, the Tapash Collaborative was 1 of 10 projects nationwide to receive funding under the Collaborative Forest Landscape Restoration Act. Work done as part of IMAP formed the scientific basis for the landscape-scale component of the proposal, which identified a restoration strategy for 920,000 acres of land under federal, state, and private management in eastern Washington.

The IMAP models and data also are being used in the Colville and Okanogan-Wenatchee Forest Plan revision process, and are expected to continue to be useful to Washington DNR as well. In fact, Brodie says he would like to see more landscape analyses: "We already know how bad the current approach and the 'no management' approach are; let's build some new alternatives and look at some different types of management."



Joe Bernert and Joshua Halofsky

This map illustrates changes in vegetation density over the next 50 years under the current management regime on the eastern slope of the Cascades in central Washington.

IMAP Becomes ILAP and Broadens Its Geographic Range

In 2009, the project received a financial boost: nearly $6 million in American Recovery and Reinvestment Act (ARRA) money, commonly referred to as stimulus funding. Hemstrom and Jamie Barbour, program manager for the PNW Research Station's Focused Science Delivery program, applied for the funding to demonstrate the usefulness of extending these models across really large areas and across diverse ecosystems. "It made sense to expand the scope of our work within the West and take advantage of previously established working relationships with national forests in Arizona and New Mexico," Barbour says. To denote the new sphere of collaboration and differentiate the project from IMAP, which only covers Oregon and Washington, a new name was chosen: the Integrated Landscape Assessment Project (ILAP).

The primary intention of ARRA funding was to create jobs. One of the first jobs for ILAP was created when Janine Salwasser was hired as project coordinator. "I was unemployed when I got hired on this project, so I am an official beneficiary of the stimulus funding," she says. In addition to Salwasser's position, over the two-year period of the ARRA funding, about 50 short-term jobs have been created to help do the analysis and mapping work.

The project's commitment to incorporating user feedback was tested early on. "We started calling this the Integrated Fuels Prioritization Project, with the idea that we would help managers prioritize the placement of wildfire risk-reduction treatments on the landscape," says Salwasser. "But our partners in the Southwest said that wasn't really what they wanted. They were interested in larger landscape issues and the broader set of habitat, climate change, and community economic questions we were addressing." In addition, partners were interested in ILAP's goal of building models for vegetation change across all forest and rangelands on all ownerships across Oregon, Washington, New Mexico, and Arizona. The broader scope suits project partner Reuben Weisz, an analyst on the planning and watershed staff for the Forest Service's Southwest Region. He has helped the ILAP team by providing vegetation data and models, but also stands to benefit from the project's outputs in his work helping national forest staff with forest planning and National Environmental Policy Act requirements. "ILAP is helping us put data and models together for every acre of wildland in the Southwest, land that is managed by the National Park Service, Bureau of Land Management, Department of Energy, states, and private land owners," he said. "By having these models in place in the future as we continue to develop forest plan revisions, we'll be able to look at all lands," not just those of the Forest Service, Weisz adds.

ILAP is helping us put data and models together for every acre of wildland in the Southwest.

Broad landscape perspective helps collaboration

Interest in all-lands management has led to collaborative landscape restoration efforts across much of the United States. Known by an alphabet soup of acronyms, these formal alliances overlap with local restoration collaboratives. ILAP methods could potentially serve as a common frame of reference for these diverse groups. "ILAP could help in terms of collaboration with other agencies, with the idea of realizing a huge potential for efficiency and consistency," says Jack Triepke, a Forest Service ecologist and the ILAP coordinator for the Southwest Region. "Right now there are a number of landscape-scale assessments going on with a lot of duplicate efforts and little coordination among them."

Landscape-scale conservation strikes a particular chord in the Southwest, in part because of the unique landscape. The forests in southeast Arizona, for example, are clustered in "sky islands" on mountains managed by the Forest Service, and separated by vast expanses of desert and grasslands under a variety of ownership.

"The Coronado National Forest is dispersed across several mountains; it's not one continuous place," says Brooke Gebow, who works as a preserve manager for The Nature Conservancy and also leads a fire management collaboration with the Coronado National Forest. "You have forests higher up and then grassland, valley bottom, or at the lowest elevation, desert, between the mountain ranges. We are trying to move planning out to more natural boundaries, and to include neighboring land managers."

Looking beyond political boundaries and working in collaboration with other landowners can help managers like Gebow address large-scale, long-term issues like climate change. Jennifer Ruyle, a forest planner on the Coronado National Forest, also sees the value to this approach, particularly when developing plans to mitigate and adapt to climate change. She describes the pattern of vegetation types in the Coronado National Forest as bathtub rings going up the mountains. "The vegetation types at the highest

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Sky Island region, Arizona. Different landowners have different objectives for their land. Landscape models are a tool that can help clarify the role of each landowner and help identify ways to work together to produce mutually desired outcomes.

elevations are probably at the most risk under the projected warmer, drier conditions we're likely to see with climate change," she explains. "One reason we got excited about ILAP is that they are incorporating climate change into the assessment."

Ranchers are very interested in knowing how climate change may affect vegetation. ILAP gives us a scope of information we didn't have before.

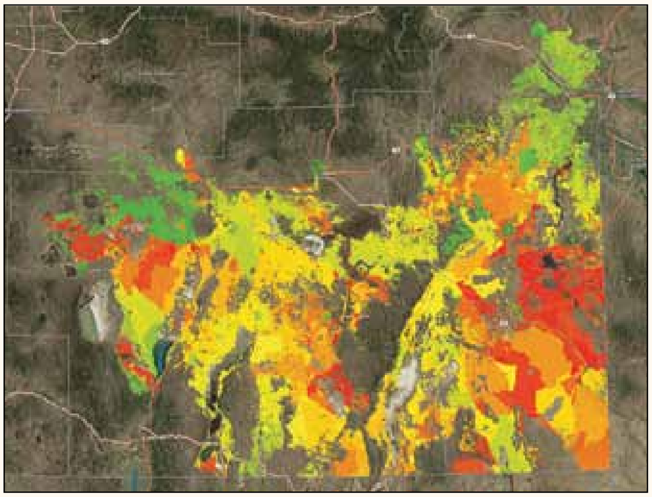
This enables Ruyle to consider climate change as a factor in forest plan revisions, and it helps her communicate with local people who depend on natural resources. "Most of our local communities are economically dependent on livestock grazing," she explains. "Ranchers are very interested in knowing what is going to happen in terms of vegetation under different climate scenarios. ILAP gives us a scope of information we didn't have before."

Adding community economic research

The ARRA funding also provided some new lines of research addressing social and economic issues in rural communities. Claire Montgomery, a professor in the Department of Forest Engineering, Resources, and Management at Oregon State University, began overseeing a new component of the project. "Initially, ILAP centered on three criteria: fire hazard reduction, benefits to wildlife, and whether fuel treatments could pay for themselves," she explains. "I said, what if you had a fourth criterion: to simulate economic activity in communities that are distressed?"

Given that the object of the Recovery Act was to lay a foundation for economic growth and revitalize rural communities, Montgomery's line of inquiry fit perfectly. In much of the West, rural communities are facing economic hardships stemming from issues directly related to forest management, such as changes in the forest products industry. In the dry forest zone of eastern Oregon, for example, where mills have closed and federal timber receipts are dwindling, several counties suffer from some of the highest unemployment rates in the Nation.

Montgomery's work will provide an opportunity to study the possibility that forest restoration activities, like fire hazard reduction, could benefit rural communities. "Since the basic



Megan Creutzburg, Josh Halofsky, and Miles Hemstrom

This ILAP output shows the cumulative risk of invasion by non-native annual grasses, such as cheatgrass, over 50 years. Dark green indicates areas of low risk, although this could mean the area already has high levels of cheatgrass; dark red indicates high risk.

unit of analysis in ILAP is the watershed, we decided to assign scores to each watershed that would indicate a priority if your policy objective was to help these communities," she explains. Of course, management generally has to meet multiple objectives. The ILAP process makes integration of many objectives easy and explicit.

Right now Montgomery's team is scoring each watershed in Oregon and Washington in three categories: distress, which includes levels of poverty and unemployment; capacity, which measures a community's ability to absorb resources; and policy, which measures the impact of federal forest policy on the health of a community. In the future, they would like to score the biomass potential of a watershed, indicating where wood might be profitably brought to market and the economic effect that would likely have on the communities involved. ILAP also allows managers to consider the economic benefits of jobs tied to other management and restoration activities.

Frank Vanni

La Grande, Oregon. The data and tools developed for ILAP can support evaluations that extend beyond biophysical management issues like habitat protection, fire risk, and invasive species. They may also be used to address social issues such as rural economic development, carbon markets, and biomass energy opportunities over a large landscape.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Sky Islands region, Arizona. "The more partners, the better," is one motto of the ILAP team. Maintaining partnerships requires time and effort but ensures the quality and relevance of the information produced. ILAP partners include local, state, and federal agencies, nongovernmental organizations, and universities.

Building A Coherent Whole Out of Many Pieces

Technological advances over the past 20 years have created new ways to approach landscape analysis. Advances in data collection and computer simulation, along with the innovation of bundling different modules—such as wildlife habitat, community economics, fire risk, and climate change—into a single modeling framework, have made it possible to answer questions in new and more empirical ways. ILAP draws on technical expertise from many different fields and then synthesizes this information across disciplines. "What we do is build connections," says Hemstrom. "Sometimes this results in new knowledge because once you start integrating, you may find that interactions produce results you hadn't considered."

We build connections. Sometimes this results in new knowledge because once you start integrating, the interactions may produce results you hadn't considered.

Integration across disciplines enhances the relevance of the maps and tools produced, but it can also create tension. The scientists and analysts on the team contribute their unique skills and perspectives but also must be able to communicate with each other. And, the scientists and land managers who use ILAP need to communicate.

"We have to try to strike a balance," explains Hemstrom. "We work with a lot of people who aren't computer modeling experts. As open as we try to keep our process, there are still going to be some pieces that are technical. The hardest part of having such a commitment to user involvement is knowing how to connect."

The success of this sweeping effort rests on the principle that these analyses are driven by policy problems rather than scientific curiosity. Early in the development of the IMAP project, pilot tests of the modeling framework were designed after discussions with users. "We solicited input from local forest management officials, and based on their input we came up with different management scenarios reflecting some of the realistic landowner objectives and policy mandates," says Hemstrom. "We always try to help participants find ways to translate their ideas for forest management into landscape models."

User participation can be a challenge. In fact, managing relationships makes up a big part of Janine Salwasser's work.

"ILAP is the result of tremendous partnership, working at all levels of government and with all types of organizations," she says. In addition to maintaining connections with long-term partners in Oregon and Washington, there are many new partners in the Southwest, including the Forest Service Southwest Region, Arizona Division of Forestry, Arizona Department of Game and Fish, New Mexico Division of Forestry, and a local restoration alliance called Fire-Scape. Salwasser estimates that she regularly keeps in touch with over 100 people connected to the project.

But user involvement, although difficult to foster, is critical. "Having the two regions, the Northwest and the Southwest, really strengthens the project," says Salwasser. "With this diversity, there are many different perspectives that have helped us broaden our scope." As the research community learned from earlier large-scale landscape modeling projects, it is important to involve stakeholders from the beginning.

ILAP helps people understand and visualize the long-term consequences of various management approaches across big landscapes.

Hemstrom adds another lesson learned. "Scale matters," he says. "The tools you use when looking at the scale of a state might be cumbersome or inappropriate when looking at the scale of a stand, and vice versa."

Managing expectations

With the huge breadth of the natural resource issues covered, as well as the ambitious number of partners involved, it can be difficult to meet everyone's information needs. The Oregon Department of Forestry (ODF) has been a major stakeholder from even before the project was known as IMAP, and still hopes to get some useful information, but has yet to see what they were hoping for. "We are a little bit frustrated," says David Morman, director of the Forest Resources Planning program at ODF. "The project keeps getting expanded to larger and larger landscapes without showing a proof of concept at the smaller landscape. The scale resolution is not really what our policy folks are looking for."

U.S. Forest Service

Mount Hood, Oregon. The ILAP team hopes to expand the project to address landscapes across the entire western United States. The project enabled more than 50 jobs to be created or retained, including positions for fire ecologists, foresters, geographers, landscape ecologists, wildlife biologists, and more.

As the success of the project rests on its utility to stakeholders, managing the expectations of partners takes on substantial importance. "It is a challenge," says Jamie Barbour. "You have to pay attention to all the partners' needs all the time, or they get frustrated." Hemstrom concurs. "Another lesson I've learned is that outreach is way more difficult than it sounds," he says. "I have begun to think that a lot of the projects that say they are aimed at users, including ILAP, don't devote enough resources to actually working with the users. It wouldn't have been too much to have devoted 20 percent of our budget to actually working directly with people to make sure we are answering their questions."

Despite this, ILAP continues to make progress in meeting stakeholders' needs. "Success has come when people have taken pieces of what we've done and started using them," says Barbour. "For example, [Pacific Northwest] Region 6 has taken the state and transition modeling process from our framework and started adapting it for their forest plan revision process. They are reinventing. We see this as success."

ILAP is one tool among many available to help land managers and others perform integrated landscape analysis. ILAP products are designed so to be integrated with information from other tools (e.g., the Watershed Condition Framework, the Climate Change Scorecard, and the Wildfire Cohesive Strategy) in a decision support framework that allows people to better understand how opportunities and priorities might come together in landscapes.

What's new about ILAP is how it helps people understand and visualize the long-term consequences of various management approaches across big landscapes. "When people figured out how to boil down complex systems into box and arrow pictures, that was a real innovation," says Barbour. "ILAP has expanded that idea, building in interconnected modules to address all kinds of management issues. It creates a science-based starting point for users from different agencies and organizations to come together and develop broad strategic plans by working from the same frame of reference. Success may just be as simple as the fact that people didn't know you could do that before."

The Inner Workings of the Models

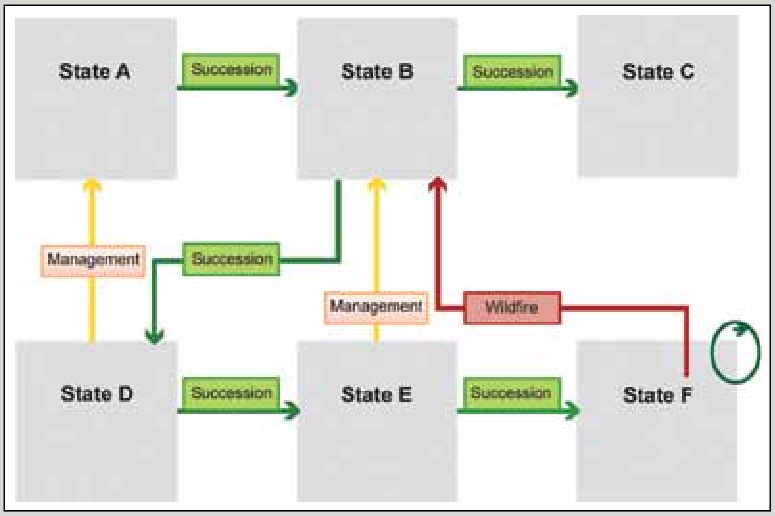
Improving our ability to predict how patterns of forest and rangeland vegetation will change over time at the landscape level, particularly in response to human activities or natural disturbances, can lead to better decisions. One way to map the behavior of these vegetation processes is through state and transition or "box and arrow" models. This is the approach the Integrated Landscape Assessment Project (ILAP) is built on. It assumes that vegetation changes over time, with or without human interference or disturbances. For example, an area covered with grass and forbs may become shrubland with some tree regeneration after about 15 years. As decades pass, the shrubland may become a young forest, and eventually, as shade-tolerating species move in and create an understory, the stand becomes mature forest.

In state and transition models, these stages along the pathway of vegetation development are classified as "states." In the absence of management or disturbance, vegetation shifts through the various states as it develops over time. Adding management actions and natural disturbances creates many different possible trajectories.

The models incorporate data from on-the-ground measurements by the Forest Inventory and Analysis program, or from a commonly used modeling program, the Forest Vegetation Simulator. Building the models also requires pinning down the likelihood of various disturbance transitions. "Disturbances are difficult to predict," explains Hemstrom. "What you do is try to figure out the average probability that fires, for example, will occur over time, and then how much variation there is around that average. If you have a lot of data, you're going to be right pretty often."

Disturbance transitions are based to some extent on professional judgment, although advances in modeling techniques and the science of ecology in recent years have reduced reliance on expert opinion and bolstered the science underpinning those assumptions.

The unit of analysis for ILAP is the watershed, or 5th hydrologic unit code, which usually covers about 100,000 acres. At this resolution, the models are useful for illustrating broad landscape conditions and helping managers decide which watersheds are the best candidates for restoration treatments that could meet multiple management objectives. Model results are summarized and displayed visually in maps, tables, and graphs, or as databases. State and transition models are not meant to design specific projects at the individual stand level.



Joshua Halofsky and Megan Creutzburg

State and transition models are depicted with boxes and arrows. They help users see pathways between different vegetation "states" of succession, which are represented by boxes. The arrows linking them together represent "transitions" generated by management actions or natural disturbances. In this example, green, yellow, and red arrows show succession, management activities, and wildfire respectively.

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Science Update

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SUMMARY

What's a land manager to do with limited financial resources when fire risk is already unacceptably high in forest stands home to federally protected species, and an insect outbreak occurs on neighboring land? A challenge like this calls for a strategic, coordinated effort among ownerships across the landscape. The Integrated Landscape Assessment Project (ILAP), led by scientists with the Pacific Northwest Research Station, is working with public and private land managers in Arizona, New Mexico, Oregon, and Washington to help prioritize land management at the watershed scale. ILAP models let users evaluate potential scenarios and develop a pathway through complex problems toward a decision. ILAP can be used to assess wildlife habitat, community economics, fire risk, vegetation development, and likely effects of climate change.

For More Information *(from page 11)*

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